WHAT IS CLAIMED IS:

1. A polymer electrolyte fuel cell system comprising:

water quantity detection means for detecting a quantity of water produced by the fuel cell;

saturated water vapor content detection means for detecting a saturated water vapor content in an exhaust gas of the fuel cell;

water quantity control ratio calculation means for calculating a water quantity control ratio which is defined as a ratio of the quantity of water detected by the water quantity detection means to the saturated water vapor content in the exhaust gas detected by the exhaust-gas saturated water vapor content detection means; and

operation control means for controlling an operating state of the fuel cell such that the water quantity control ratio is within a predetermined range.

2. The fuel cell system according to claim 1, wherein:

the water quantity detection means detects the water quantity based on an output current of the fuel cell.

3. A fuel cell system according to claim 1, wherein

the saturated water vapor content detection means

comprises:

pressure detection means for detecting a pressure of the exhaust gas;

temperature detection means for detecting a temperature of the exhaust gas;

flow rate detection means for detecting a flow rate of the exhaust gas; and

calculating means which calculates the saturated water vapor content in the exhaust gas based on the pressure of the exhaust gas, temperature of the exhaust gas, and flow rate of the exhaust gas.

4. The fuel cell system according to claim 1, wherein the operation control means controls the operating state of the fuel cell such that the water quantity control ratio is within a range which includes a value of one as the predetermined range.

5. The fuel cell system according to claim 4, wherein the operation control means controls the operating state of the fuel cell such that the water quantity control ratio is within a range of 0.7 to 1.4 as the predetermined range.

6. The fuel cell system according to claim 4, wherein the operation control means controls the operating state of the fuel cell such that the water

quantity control ratio becomes equal to a value of one.

7. The fuel cell system according to claim 1, further comprising:

condition alteration means for altering at least one condition of a flow rate of the exhaust gas, a pressure of the exhaust gas, a temperature of the exhaust gas, and an output current of the fuel cell as the operating state of the fuel cell,

wherein

the operation control means controls the condition alteration means which alters at least one condition of the flow rate of the exhaust gas, the pressure of the exhaust gas, the temperature of the exhaust gas, and the output current of the fuel cell such that the water quantity control ratio is within a predetermined range.

8. A polymer electrolyte fuel cell system comprising:

relative humidity detection means for detecting a relative humidity of an exhaust gas of the fuel cell; and

operation control means for controlling an operating state of the fuel cell such that a water quantity control ratio equivalent to the relative humidity is within a predetermined range.

9. The fuel cell system according to claim 8, wherein

the operation control means controls the operating state of the fuel cell such that the water quantity control ratio is within a range that includes a value of one as the predetermined range.

10. The fuel cell system according to claim 9, wherein

the operation control means controls the operating state of the fuel cell such that the water quantity control ratio is within a range of 0.7 to 1.4 as the predetermined range.

11. The fuel cell system according to claim 8, wherein

the operation control means controls the operating state of the fuel cell such that the water quantity control ratio becomes equal to a value of one.

12. The fuel cell system according to claim 8, further comprising:

condition alteration means for altering at least one condition of a flow rate of the exhaust gas, a pressure of the exhaust gas, a temperature of the exhaust gas, and an output current of the fuel cell as the operating state of the fuel cell,

wherein

the operation control means controls the

condition alteration means which alters at least one condition of the flow rate of the exhaust gas, the pressure of the exhaust gas, the temperature of the exhaust gas, and the output current of the fuel cell such that the water quantity control ratio is within the predetermined range.

13. A polymer electrolyte fuel cell system comprising:

water quantity detection means for detecting a quantity of water produced by the fuel cell;

water vapor content detection means for detecting a water vapor content in exhaust gas of the fuel cell; and

abnormality judgment means for judging a system abnormality based on the quantity of water detected by the water quantity detection means and the water vapor content in the exhaust gas detected by the exhaust-gas water vapor content detection means.

14. The fuel cell system according to claim 13, wherein

the abnormality judgment means judges the system to be abnormal when a deviation between the quantity of water and the water vapor content in the exhaust gas is not within a predetermined range.

15. The fuel cell system according to claim 13, further comprising

alarm output means for outputting an alarm when the abnormality judgment means judges a system abnormality.

16. A method for operating a polymer electrolyte fuel cell, comprising a step of

controlling an operating state of the fuel cell such that a water quantity control ratio as a ratio of a quantity of water produced by the fuel cell to a saturated water vapor content in exhaust gas of the fuel cell is within a predetermined range.

17. The method according to claim 16, wherein

the operating state of the fuel cell is controlled such that the water quantity control ratio is within a range of 0.7 to 1.4.

18. The method according to claim 17, wherein

the operating state of the fuel cell is controlled such that the water quantity control ratio becomes equal to a value of one.

19. A method for operating a polymer electrolyte fuel cell, comprising of a step of

controlling an operating state of the fuel cell such that a water quantity control ratio equivalent to a relative humidity of an exhaust gas of the fuel

cell is within a predetermined range.

20. The method according to claim 19, wherein

the operating state of the fuel cell is controlled such that the water quantity control ratio is within a range of 0.7 to 1.4.

21. The method according to claim 20, wherein

the operating state of the fuel cell is controlled such that the water quantity control ratio becomes equal to a value of one.

22. A polymer electrolyte fuel cell system, comprising:

a fuel cell; and

a control system having a first detector positioned and configured to detect a quantity of water produced by the fuel cell,

a second detector positioned and configured to detect a saturated water vapor content in an exhaust gas of the fuel cell,

a calculator portion positioned and configured to calculate a water quantity control ratio which is a ratio of the quantity of water to the saturated water vapor content in the exhaust gas, and

a control portion positioned and configured to control an operating state of the fuel cell such that the water quantity control ratio is within a

predetermined range.

23. A polymer electrolyte fuel cell system, comprising:

a fuel cell;

a control system having a detector positioned and configured to detect relative humidity of an exhaust gas of the fuel cell; and

a control portion positioned and configured to control an operating state of the fuel cell such that a water quantity control ratio equivalent to the relative humidity is within a predetermined range.

24. A polymer electrolyte fuel cell system, comprising:

a fuel cell; and

an abnormality judgment system having a first detector positioned and configured to detect a quantity of water produced by the fuel cell,

a second detector positioned and configured to detect a water vapor content in an exhaust gas of the fuel cell, and

a judging portion positioned and configured to judge an abnormality of the fuel cell system based on the quantity of water and the water vapor content in the exhaust gas.